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## COMPREHENSIVE EXAMINATIONS.

BY ELIZABETH B. COWLEY.

What test is to be applied in deciding whether the pupil has completed the work of one grade in such a manner that he is qualified to carry the studies of the next? Is it to be decided by the averages of the daily recitations and the weekly or monthly tests which are prepared and marked by the teacher, or is the decision to be based on the result of a final examination set and marked by some one who did not teach the class? Although this question arises in every grade, it is perhaps felt most keenly at the time of transition from secondary school to college. The friends and foes of the certificate system and the old plan examinations have enumerated and defended, or attacked, many vices and virtues in each plan. A not unnatural result of these lively discussions is a desire on the part of some to suggest a compromise in which they hope to retain the strongest points of each and from which they would eliminate the weakest features of both.

Such a compromise is set forth in the so-called "Comprehensive Examinations," which have been adopted at Harvard, Princeton, and Yale, and which are a part of the "New Plan of Admission" to Mount Holyoke, Smith, Vassar, and Wellesley. The essential features are briefly these: (1) the candidate is to be admitted without conditions or not at all; and (2) the evidence submitted is to be of two kinds, (*a*) that offered by the school, consisting of the complete report on four years' work and the principal's estimate of the candidate's qualities, and (*b*) that offered by the student, consisting of comprehensive examinations in four subjects. These examinations are to be those offered by the College Entrance Examination Board. There are, of course, some differences in the method of administration of the system in the different institutions.

The general aspects of the comprehensive plan as a whole have been discussed at length in papers appearing in such maga-

zines as *Education* and the *Educational Review*. The teacher of mathematics is, as a broad-minded educator, interested in the whole scheme. But after he has studied the general question, he will naturally inquire what relations these comprehensive examinations can and may have to the teaching of his own subject. It is the purpose of this paper to offer some suggestions along this line.

The first question may well be: Does mathematics lose anything by the new plan? The teacher who has been accustomed to the old examination system will immediately reply that there is a lowering of standards, because it is only at two of the seven colleges (Princeton and Yale) that every candidate is required to present himself for examination in mathematics. At the other five colleges the student may substitute physics or chemistry. These critics argue that the inevitable result on schools or individuals weak in mathematics will be to slight this subject more than ever and to cover up the deficiencies by offering chemistry or physics on examination. In this connection it is well to draw attention to the fact that the four women's colleges have at their disposal a means of correcting any great abuse along this line, for they require that the candidate's choice of the fourth subject offered on examination must be approved by the committee on admission of the selected college.

Another objection raised is that there is a weakening in the requirement for those who are examined in mathematics, because formerly the candidate had to pass a two-hour examination in plane geometry and at least one (and possibly two) in algebra, while under the new plan there is substituted one three-hour examination. They offer us the following comparisons of the June (1916) papers. Under the old plan a student would receive 67 per cent. in plane geometry by answering four out of six required questions and 71 per cent. in algebra by solving five out of seven problems. But, say the critics, the whole comprehensive paper on elementary mathematics contains only five questions on algebra and four on plane geometry. Hence if this work had been offered on a comprehensive paper it would have been marked 100 per cent., meaning perfect in algebra and geometry. Take it the other way round. A candidate would receive 67 per cent. for answering six of the nine questions on

the comprehensive paper. He could do this by taking two on algebra and four on geometry, or three on each, or four on algebra and two on geometry, or five on algebra and one on geometry. What would each of these combinations have given him under the old plan?—29 per cent. and 67 per cent. for the first combination, 43 per cent. and 50 per cent. for the second, 57 per cent. and 33 per cent. for the third, and 71 per cent. and 17 per cent. for the fourth. But is this a fair statement of actual conditions? Under the old plan a candidate was not required to be prepared on more than one subject at a time and he was given two hours for the examination on each separate subject. Under the new plan he must have all his material in hand at once and he is allowed only one period of three hours to cover all his elementary mathematics. And it must be remembered that a comprehensive paper is not obtained by taking five questions from an old plan paper in algebra and four from another in plane geometry. Nor is it to be forgotten that answer books of comprehensive examinations are to be judged qualitatively as well as quantitatively.

Some teachers see a third loss in the removal of the requirement of a senior review of any mathematics taken in the early years of high school. But have not the colleges been guilty of insisting upon requirements that caused a serious overcrowding in the senior year? All departments must be willing to do their share, if this defect is to be remedied. If we who teach mathematics insist upon our subject and forget the others, are we displaying the reasonableness and sense of proportion which we are fond of numbering amongst the qualities that result from an intensive and extensive study of our subject? There are some persons who think that there is a blessing in disguise in the removal of the requirement of review. Experienced teachers know how perfunctory these reviews sometimes become and they know that, even when they are well conducted, they have sometimes been harmful because too much confidence has been placed in their power to rectify the havoc wrought by the incompetent and ignorant teacher of a beginning class. In considering this question of the senior review it must be kept in mind that the comprehensive examinations must be taken just before the student enters college. This requirement will automatically elimi-

nate a high-school which plans to do superficial work and to complete it early.

What arguments are offered in favor of these comprehensive examinations? It is claimed that the requirement that the one examination shall cover all the mathematics previously studied will discourage one type of candidate who is really not "college material" but who satisfied the letter of the law of the old requirements. This pupil crammed algebra until he could attain a passing grade in that subject and then emptied his mind of that material and proceeded to commit to memory (temporarily) a text in plane geometry with a view to passing in that subject. A candidate who is a mere memorizer will be sadly embarrassed by the comprehensive examination.

Some educators see a distinct gain in the requirement that no student may present himself for examination unless he can satisfy the committee on admission of his selected college that he has actually studied the work upon which he wishes to be examined. This point will appeal to those readers in algebra who have meditated upon the contents of the answer books. They know that too many of the books bear strong internal evidence that the writers have studied nothing beyond quadratics, but have taken their chances on A or A<sub>2</sub>. Of course, there are some who admire these venturesome young people. Some other persons (who do not teach freshman mathematics in college) assert that a boy who is shrewd enough to pass under these conditions ought to "get by" in college. It is not worth while to argue this matter here. But there is another point worthy of consideration in this connection. Many who venture in this way fail and it must not be forgotten that one of the most widely read of the recent critics of mathematics as a school subject bases some of his assertions upon the percentage of failures in College Entrance Board Examinations in algebra.

Another advantage claimed for the comprehensive examination is that it forces the student to realize that algebra, geometry, and arithmetic are all parts of one big subject, and not separate, isolated, and unconnected studies. Perhaps the weakest point in any system which depends upon several tests based on limited portions of the subject, instead of one final examination on the whole, is the danger that, even though the pupil masters the

details of the various parts, he may fail to get any realization of the relations of the parts to one another. A candidate who contemplates taking the comprehensive examination will be forced, by the mass of material before him, to make an effort to discover some of the fundamental principles and to learn to apply them.

There is another point to which attention may well be directed. Under the new system, where the reader must give not only the more or less mechanical rating already used in marking, but also decide whether certain good and bad qualities are exhibited in each book, there is a splendid opportunity to be on the alert for weakness in arithmetic work. The college teachers of chemistry and physics and the business men tell us that too many college students are lamentably weak "at figures" and are ignorant of some of the simplest operations in arithmetic. We know, alas, that these statements are not made without some foundations of facts. We have before us at the present time an unusual opportunity to attack this arithmetic weakness. But we cannot make the most of the situation unless we can get a positive, definite statement on the examination papers. At the top of the comprehensive paper in English (June, 1916) there is printed: "However accurate in subject matter, no paper will be considered satisfactory if seriously defective in punctuation, spelling, or other essentials of good usage." What we need in mathematics is a statement to the effect that no paper which is seriously defective in arithmetic will be considered satisfactory. We must remember, however, that we shall never get this by merely hoping for it. It may be remarked in passing that the committee on admissions of at least one of the seven colleges mentioned above has sent an urgent request to the College Entrance Examination Board for the insertion of such a statement on the mathematics paper.

Finally, we invite a careful consideration of the system of comprehensive examinations. It depends for its success upon the cordial and intelligent co-operation of all persons concerned; the candidate, his teachers in high school and college, and those who set the examinations and those who read the answer books.

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